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National Science Foundation

# Engineering News

Spring 1996

CONTIN

## ENG Announces Director Searches

The Directorate for Engineering is conducting a nationwide search for a director in its Chemical and Transport Systems (CTS) Division and for several program directors in the ENG divisions. While disciplinary expertise is expected of each candidate, the focus of the search is to assemble a scholarly, open-minded, diverse, and intellectually integrated group to join the present team in sharing ENG's responsibilities within NSF's overall mission to support integrated merit-reviewed education and research activities.

Nominations and applications for the CTS Division director position should be sent to Dr. Elbert L. Marsh, Chair, Personnel Committee, Directorate for Engineering, National Science Foundation, 4201 Wilson Boulevard, Room 505, Arlington, VA 22230; tel. (703) 306-1301; fax (703) 306-0289; e-mail emarsh@nsf.gov.

Applications and nominations for program director positions should be directed to relevant divisional members of the Personnel Committee (same address) listed below:

Bioengineering and Environmental Systems, Gilbert Devey, Room 565, (703) 306-1320; Chemical and Transport Systems (Chemical Reaction Processes or Interfacial, Transport, and Separation Processes), Mihail C. Roco, Room 525, (703) 306-1371; Civil and Mechanical Systems (Geomechanical, Geotechnical, and Geoenvironmental Systems or Mechanics and Materials), Ken P. Chong, Room 545, (703) 306-1360; Design, Manufacture, and Industrial Innovation (Manufacturing Machines and Equipment or Small Business Innovation Research), Darryl G. Gorman, Room 550, (703) 306-1330; Electrical and Communications Systems (Solid State and Microstructures), Deborah Crawford, Room 675, (703) 306-1339; and Engineering Education and Centers, Sue Kremnitzer, Room 585, (703) 306-1380.

NSF division directors and program managers are responsible for overseeing integrated research and education in a particular discipline, a set of disciplines, or across disciplines within the context of agency vision, mission, and goals, and within the framework of guiding legislation and agency policies resources.

Generally, the essential requirements for directorate openings are a Ph.D. or equivalent professional experience; a successful research and education career in academia, industry, or government; and substantial management expertise.

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## Women and Minority Engineering Educators Workshop Deemed a Success

Participants in the recent NSF "Workshop for Advancement and Retention of Women and Underrepresented Minority Engineering Educators in the Area of Dynamic Systems and Control" are hailing it as a complete success.

In keeping with the diversity-related goals stated in the NSF strategic plan, *NSF in a Changing World*, the workshop was designed to encourage and empower women and underrepresented minority engineers in the pursuit of engineering research challenges.

The meeting brought together a select group of 40 of the nation's outstanding engineering educators with the intent of instilling in them the sense of a technical community in which they could thrive and to which they could contribute effectively.

Dr. Elbert L. Marsh, ENG deputy assistant director, opened the workshop with a discussion of NSF's significant role in the technologically changing world. Speakers presented an overview of prominent research challenges in the areas of controls, dynamics, diagnostics, and vibrations and acoustics. Other presenters gave summaries of their current research interests, illustrating the rich diversity of related opportunities in the field of dynamics and control research.

In addition to attending the two-plus days of sessions, participants took guided technical tours of several national research laboratories.

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***Women and Minority Engineering Educators*** *(Continued from p. 1)*

Professor Alison Flatau, NSF Young Investigator, Iowa State University, Ames, IA, organized the workshop, which was jointly sponsored by the Civil and Mechanical Systems Division's Dynamic Systems and Control Program (with help from program director Dr. Devendra P. Garg) and the Division of Engineering Education and Centers' Human Resources Development Program (aided by its program director, Dr. Daniel C. Davis).

Proceedings will be available shortly. Call Dr. Garg at (703) 306-1360 for additional information.

# FastLane on the Web

The National Science Foundation, through its FastLane project, is taking advantage of advances in Web/Internet technology to provide an interactive electronic interface to NSF's engineering and scientific community. There are many functions included in the FastLane project that are of interest to NSF Principal Investigators (PIs). One includes electronic capabilities that allow a PI to complete and submit all the necessary forms required for proposal submission. The proposal can then be forwarded electronically to the appropriate office within NSF. Status tracking of submitted proposals and final reports is also enabled through FastLane. New functions planned for the coming months include Annual Progress Report Preparation and Submission and Post-Award Requests and Notifications. In addition to these functions, the FastLane allows PIs to update their own personal information such as name, address, phone number, and e-mail address.

The FastLane home page is available through the NSF home page (www.nsf.gov). You may also access it directly at www.fastlane.nsf.gov. PIs from FastLane-registered institutions are invited to use these new capabilities. A list of FastLane-registered institutions is available from the FastLane home page. If you would like to use FastLane and your institution is not registered, please read the registration information from the FastLane home page. Once your institution is registered with FastLane, you may get your Personal Identification Number (PIN) from your sponsored research office. For more information about the use of individual functions in FastLane, please see the Information about FastLane hyperlink on the FastLane home page.

For additional information, contact Ms. Carolyn Lalumiere at (703) 306-1145.

NSF *Engineering News* is sponsored by the National Science Foundation's Directorate for Engineering (ENG). Its purpose is to promote current awareness of ENG activities throughout the engineering community by described programs, policies, meetings, research projects, and other activities sponsored by the Directorate. For further information, contact the Editor, Glenn H. Larsen, Directorate for Engineering, National Science Foundation, Arlington, VA 22230, or call (703) 306-1306, e-mail glarsen@nsf.gov, TDD# (703) 306-0090. Additional information may also be obtained by contacting the Associate Editors in the Divisions, as follows:

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# NSF Struggles with Shutdown Backlog

***NSF Director Neal Lane and Deputy Director Anne Peterson welcome ENG's Program Director Ed Bryan (center) back from the furlough.***

NSF employees are struggling to catch up with a backlog of research proposals, mail, and other duties following the recent government shutdown over the budget crisis.

NSF Director Neal Lane is concerned about the serious long- and short-term impact the unprecedented shutdown could have on the nation's research and education community. He says it has already been very disruptive: "Although science will go forward, it will limp painfully."

Mail clerks and research proposal processing technicians worked overtime to cope with the backlog. The agency receives about 53,000 proposals each year and makes about 20,000 awards. Usually, a grant is awarded or declined within six months of its receipt, but NSF officials are telling proposers to expect delays caused by the backlog of almost 7,000 proposals.

# ENG's Bert Marsh Named Engineer of the Year

Dr. Elbert L. Marsh, Deputy Assistant Director, NSF Directorate for Engineering, has been named NSF Federal Engineer of the Year by the National Society of Professional Engineers. Cited for his many contributions to NSF and to the nation, he is also recognized for a wide-ranging career that has included teaching engineering at several universities, participating in community programs to attract young persons to engineering careers, and contributing immeasurably to aerospace engineering.

Before coming to NSF, Dr. Marsh participated in the nation's planetary research program at CalTech's Jet Propulsion Laboratory, where he led a team of engineers in developing the Galileo spacecraft attitude control system software design, a system responsible for positioning the spacecraft and its instruments correctly to gather planetary data and to maintain proper attitude for effective communication between the spacecraft and earth. He also worked with the Lockheed Missiles and Space Company, Sunnyvale, CA, and has taught engineering at Howard University, Washington, DC; California State University, San Jose; and UCLA.

Before becoming deputy assistant director of ENG, Dr. Marsh held positions in the Mechanical and Structural Systems Division at NSF.

# *U.S. Playing Bridge Catch-up*

Engineers and scientists around the world are working on a new generation of construction materials for bridges that will resist corrosion, require less repair, and last longer. Dr. John Scalzi, program director of ENG's Large Structural and Building Systems Program, Division of Civil and Mechanical Structures (CMS), cites two primary reasons for urgency in this effort. First, the civil infrastructure in the United States is degrading rapidly. The Federal Highway Commission reports that 42 percent of bridges need repair and are obsolete; the cumulative repair bill by the year 2010 is estimated to reach $50 billion. Scalzi said, "There's an international race to develop these materials, because bridges everywhere are crumbling from the effects of weather, pollution, and age." New, low-maintenance materials are needed immediately to repair and retrofit these bridges. Second, on a global scale, the nations with the most advanced design and manufacturing programs will dominate the world export market for new polymer materials. Other countries, including Canada, China, Japan, and Scotland, either have built or are planning to build bridges using polymer composites. In the near future, Scalzi asserts that suspension cables, support girders, and the main deck of many bridges will be made of braided, woven, and fused strands of composite materials developed by engineers.

The current research in polymer composite materials grew out of earlier aerospace efforts to develop radar-evading "stealth" materials, he adds, "which is a perfect example of military research spinning off into unforeseen civilian uses."

Scalzi suggests that continued research into new uses of these polymers will not only lead to better bridges, roads, and buildings, but will provide diversified commercial ventures for the aerospace firms that first developed the materials.

# *The Bottom of the World: A Strange and Magical Place*

*by George A. Hazelrigg*

On December 22, 1995, I left Washington, DC, and headed for the sunny south—far enough south that there would be only three directions left in which to go: up, down, and north. Far enough south that the sun wouldn't set on me for the next five weeks.

I'd been selected to serve as the senior station leader at the Amundsen-Scott South Pole Station. My selection came as part of an outreach program in the NSF Office of Polar Programs (OPP). OPP administers virtually all U.S. research in Antarctica and operates permanent stations at Palmer, McMurdo, and the South Pole; the office maintains a volunteer NSF representative at each of these stations during the busy austral summer.

*Dr. Hazelrigg stands at the Pole in full ECW gear, enjoying the summertime of 25° below zero Fahrenheit.*

Arriving in Auckland, New Zealand, I picked up my extremely cold weather (ECW) gear, consisting of about 40 pounds of clothing, and then proceeded to Christchurch, which is the stepping-off point to Antarctica. The flight to McMurdo took about eight hours in the ski-equipped LC-130 Hercules. We landed at Williams Field on the Ross Ice Shelf at about 11 p.m. local time. The sun was high in the sky and the weather bright and nippy.

Two days later, a three-hour trip from McMurdo to the Pole took us over the Transantarctic Mountains, one of the largest ranges on earth. The mountains rise up to 13,000 feet from the Ross Shelf, marking the edge of the continent and forming a dam behind which the snow backs up at depths ranging up to two miles. Seventy percent of the world's fresh water is in Antarctica in the form of the continental ice sheet, which reaches a depth of three miles.

The purpose of NSF's presence on the continent is research, and the South Pole is a unique place for sciences such as astrophysics. Stellar objects remain continuously visible at the Pole, merely circling the sky rather than rising and setting. This enables long-term viewing, which is not possible even from space. The Pole is also the home of the ozone hole, and what better place to study this phenomenon than the hole itself? The air at the Pole has traveled at least 1,000 miles over the Antarctic continent without coming into contact with a living thing, and clean air research conducted by the National Oceanic and Atmospheric Administration (NOAA) is a major activity.

Unlike the North Pole, which is an ocean surrounded by continents, the South Pole is on a continent surrounded by oceans. Seismic activity is focused at the Pole and couples well to the ice sheet. Seismometers buried in ice vaults provide valuable data on seismic activity in the southern hemisphere. These seismometers are so sensitive that they recorded the Oklahoma bombing last year.

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**The Bottom of the World** *(Continued from p. 3)*

***A glacier cascades down the side of the Transantarctic Mountains.***

Perhaps the most exciting project has been the construction of the Antarctica Muon and Neutrino Detector Array (AMANDA) telescope. It makes use of the deep ice—below 1.5 km from the surface—where gas bubbles are compressed into the crystalline lattice of the ice, forming an optically pure substance through which light travels distances that exceed 1 km. The telescope will look for neutrinos streaming through the earth from energetic stellar sources, enabling scientists to look into the cores of stars.

Everything seems to be a source of research projects at the Pole. For example, water is obtained from a well in the ice. Heat is pumped into the well, melting the ice, and the resulting water is pumped out. Meteorites collect on the snow surface of the well, stratified by the date of their impact; they are vacuumed out of the well every year. In another meteor project, radar was used to monitor the drift of meteor trails in the upper atmosphere to estimate upper atmospheric winds. In all, some 30 science projects are ongoing at the Pole.

During the summer, the population of the Pole station reaches 150, but it drops to 27 in February as the temperature plunges. Below –60°F it is not possible to fly to the Pole.

Work occupies most of our time. Entertainment usually consists of videos and parties. Temperatures ranged from –7°F to –35°F while I was there, and the winds were generally calm, with bright and sunny skies most of the time.

I left the Pole in early February, as the station population began to drop in preparation for the austral winter. Soon temperatures will plunge to –110°F, and the continent will be in total darkness.

Life at the Pole has its difficult aspects: the high altitude, the cold, the heavy clothing that restricts motion, the dryness, the lack of water for showers. But the awesome beauty of the continent makes the trip worthwhile.

***The Amundsen-Scott research station***

Dr. Hazelrigg is a Senior Advisor for Technology Integration in the Directorate for Engineering's Division of Design, Manufacture, and Industrial Innovation. His e-mail address is ghazelri@nsf.gov.

## *MIT Enterprise Forum Attracts Large Audience*

Public sessions of the MIT Enterprise Forum, hosted by NSF and aimed at highlighting small high-tech companies and their future plans, are proving to be popular events. The sessions, held on the third Tuesday evening of every month at NSF and sponsored by the Forum's Washington-Baltimore chapter, usually draw up to 60 people. Each meeting features a panel of experts responding with a constructive critique to a technology and business plan presented by representatives of a small company.

A recent meeting featured presenter Douglas L. Hines, president of Guide America, Inc., Crofton, MD, and panelists Alan S. Gregerman, Venture Works, Inc.; Hooks K. Johnston, Roadshow International; and Michael J. Saylor, MicroStrategy, Inc.

According to Ritchie B. Coryell, organizer of the events and a program manager in Small Business Innovation Research (SBIR) Programs, Division of Design, Manufacture, and Industrial Innovation (DMII), the discussions are "spirited and open, with full participation by the audience."

He says the sessions provide an opportunity for NSF personnel to exchange views and get a firsthand look at the dimensions of SBIR-type firms. Mr. Coryell's e-mail address is rcoryell@nsf.gov.

## *Reassignments to Spur ENG Efforts*

New assignments for two staff members—Dr. William S. Butcher and Dr. M. Christina Gabriel—are expected to help coordinate and focus a host of efforts within the Directorate for Engineering (ENG).

Butcher, who has served in a number of leadership posts, has been assigned to ENG's Division of Engineering Education and Centers (EEC) as a senior engineering adviser. He will help with EEC's integrated and multifaceted programs in research, centers, and education. He will also retain responsibility for a number of intra-directorate tasks, such as overseeing conflict-of-interest concerns and coordinating activities of Committees of Visitors.

Butcher will continue to serve as the ENG liaison to the Director's Review Board coordinator and as metric officer and liaison to engineering professional societies. In addition to his administrative duties, his present NSF interests are in engineering infrastructure and environmental matters, particularly civil infrastructure and sustainable development as it relates to engineering.

Before coming to NSF, Butcher served as water resources specialist for the president's science adviser and as the first director of the Department of the Interior's Office of Water Research and Technology.

Gabriel is assuming the position of senior engineering coordinator in the Office of the Assistant Director. She will be responsible for assisting on policy, operations, and managerial issues.

Among her new duties are coordinating the activities of the ENG Advisory Committee and ENG participation in committees of the President's National Science and Technology Council as well as other interagency interactions. She will continue to oversee the

Management of Technological Innovation program in the Division of Design, Manufacture, and Industrial Innovation.

Gabriel, an electrical engineer, has held a number of positions within and outside NSF, including stints as a visiting professor at the University of Tokyo in Japan, as a professional staff member for the U.S. Senate Appropriations Committee, and as a researcher in opto-electronics at AT&T Bell Laboratories.

You can e-mail Dr. Butcher at wbutcher@nsf.gov and Dr. Gabriel at cgabriel@nsf.gov.

## ECS Twin Seminars Review NCCE and Laser Diodes

Participants and other interested parties are mulling over the abstracts and notes of two seminars held recently at NSF and sponsored by ENG's Division of Electrical and Communications Systems (ECS).

The first seminar, a review of the National Center for Computational Electronics (NCCE), covered that group's accomplishments and activities. Among activities discussed were progress in standardization of Monte Carlo simulation, recent interaction between the semiconductor industry and national laboratories, and education focusing on interactive environments based on World Wide Web technologies.

NCCE was established at the University of Illinois at Urbana-Champaign in 1988 with the mission to coordinate interdisciplinary efforts in the area of semiconductor simulation. A second center site was formed at Stanford University four years later. NCCE membership includes groups from engineering, physics, computer science, and mathematics.

Panelists at the seminar were Dr. Karl Hess and Dr. Umberto Ravaioli of the Beckman Institute and the Department of Electrical and Computer Engineering, University of Illinois. Both professors are members of NSF's Engineering Research Center for Compound Semiconductor Microelectronics.

Dr. Hess also led the second seminar, "Simulation of Semiconductor Quantum Well Laser Diodes." His review suggests that the standard rate equation treatment is insufficient to describe strong coupling of quantum well capture to the diffusive and ballistic transport in the classical diode regions.

His discussion also indicates the desirability and feasibility of more precise simulations, combining a classical treatment of the diode (as in silicon technology simulations) and a quantum treatment solving fully coupled Schroedinger and Maxwell equations in the optically active region.

## Manufacturing Education Video Available

A student-oriented video on manufacturing engineering education, produced by the Southern California Coalition for Education in Manufacturing Engineering, is now available. Dr. Marshall M. Lih, director, Division of Engineering Education and Centers, reports that the nine-minute video is "upbeat, interesting, and shows how exciting the field is."

Copies can be obtained from Dr. J. Richard Williams, College of Engineering, California State University at Long Beach, 1250 Bellflower Boulevard, Long Beach, CA 90840-8306; tel. (310) 985-5123; fax (310) 985-7561.

## Staff Update

Ms. Cheryl Albus is a small business program specialist in the Division of Design, Manufacture, and Industrial Innovation (DMII).

Dr. Roger E. A. Arndt is on a one-year Interagency Personnel Agreement (IPA) from the University of Minnesota and is a program director in the Division of Chemical and Transport Systems' (CTS) Fluid, Particulate, and Hydraulic Systems Program.

Ms. Gracie Ashton is a program assistant in the Bioengineering and Environmental Systems (BES) Division.

Dr. Virginia Ayers, from the Naval Surface Warfare Laboratory, is on a one-year assignment as program director in the Electrical and Communications Systems (ECS) Quantum Electronics, Waves, and Beams Program.

Dr. Frederick G. Bowman is on a one-year appointment from MIT and is serving as a program director in BES's Biomedical Engineering and Research to Aid Persons with Disabilities Program.

Ms. Cynthia Cox is a Civil and Mechanical Systems (CMS) program assistant.

Ms. Theresa Davis is a secretary in CMS.

Ms. Kim Dores is a DMII office automation clerk.

Mr. Yousef S. Hashimi is a program manager in DMII's Small Business Innovation Research Programs.

Dr. Deborah A. Kaminski is on a one-year IPA from Rensselaer Polytechnic Institute and is a program director for CTS's Thermal Systems (Transport and Process) Program.

Dr. Barbara Karn, from Dr. Barb, Inc., is on a one-year appointment as program director for BES's Environmental Technology Program.

Dr. Robert Lauer is on a one-year appointment as a program director in the Division of Engineering Education and Centers' Industry/University Cooperative Research Centers Program.

Ms. Tremia Millard is a Stay-in-School aide.

Ms. Gwendolyn Owens is an administrative officer in the Division of Electrical and Communications Systems (ECS).

Ms. Betty A. Person is a DMII senior program assistant.

Ms. Bonnie D. Simon is a CTS student aide.

Dr. Chanan Singh is a program director in ECS's Engineering Systems (Power Systems) Program, and is on a one-year IPA from Texas A&M University.

Ms. Allison D. Thomas is a CTS program assistant.

Dr. George Vermont is a program director in the Biochemical Engineering Program, in BES. He is on a two-year appointment from Mallinckrodt Specialty Chemical Co.

## 1995 Career Awards Winners

In a National Science Foundation (NSF) Press Release, PR 96-5, dated February 6, 1996, NSF announced the first recipients of the "Faculty Early Career Development (CAREER)" awards. The Directorate for Engineering is providing support to about 100 of the more than 300 awardees supported by NSF in Fiscal Year 1995.

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**Career Awards Winners** *(Continued from p. 5)*

The CAREER Program was implemented in Fiscal Year 1995 to encourage the development of academic faculty as both educators and researchers early in their careers. It enhances and emphasizes the importance the Foundation places on the development of full academic careers which include and integrate both research and education. CAREER awards support junior faculty within the context of their overall career development.

The complete list of Fiscal Year 1995 CAREER award recipients is available on the Internet at <http://nsf.gov/crossdir/award/start.htm>, by e-mail from Janell Richardson at jrichard@nsf.gov, or by calling (703) 306-1070.

## Advances in Metabolic Engineering

A common plant virus containing genes from a virus pathogenic to humans infects insect cells in culture to produce proteins that could lead to a vaccine for the viral disease. "Anti-sense" synthetic genetic material (binds to genetic message carriers) is used to cancel-out or down-regulate the production of the enzyme responsible for premature softening in tomatoes. Young children with the fatal ADA immune deficiency disease can be moved out of their protective plastic bubbles into the mainstream after some of their own modified cells are returned to them. The common thread? All are examples of the purposeful modification of a living organism's metabolism to produce useful products. Programs in the Division of Bioengineering and Environmental Systems (BES) are supporting a variety of research projects in this rapidly emerging field of metabolic engineering.

The term metabolic engineering first appeared in an article by Dr. James Bailey, a biochemical engineer with the California Institute of Technology, in the June 21,1991, issue of *Science*. Bailey's work was supported by BES. He defined metabolic engineering as the improvement of cellular activities by the manipulation of enzymatic, transport, and regulatory functions of a cell using recombinant DNA technology. The definition was later broadened to encompass other cell modification techniques such as mutation and selection.

One recent award from the Biotechnology Program was to Dr. Robert Granados at the Boyce Thompson Institute at Cornell University to investigate the conditions needed for the large-scale production of medicinal and pesticidal proteins from insect cell cultures. Insect cell proteins, while more expensive to produce than the the conventional bacterial systems, are glycosylated (sugars attached) making them more like human enzymes and regulators.

Another award, to Scott Diamond, an NSF Young Investigator at the State University of New York in Buffalo, focuses on the impact of physical forces encountered in bioreactors on mammalian cells in culture. Mammalian cell cultures, e.g., hamster ovary cells, are already being used to produce valuable human drugs such as erythropoetin, which stimulates red blood cell production in anemic kidney dialysis patients.

BES personnel are also playing a leadership role on a National Science and Technology Council subcommittee working group specifically assembled to promote this valuable science across the scientific community. Dr. Fred Heineken, BES Program Director and Chair of the interagency working group, believes that metabolic engineering will help solve many of our serious health and environmental problems in the not too distant future.

## Highlights of Recent JTEC/WTEC Workshops

With management and principal funding from NSF's Engineering Directorate (Paul Herer, Program Director), the Japanese/World Technology Evaluation Program (JTEC/WTEC) supports in-depth technical assessments of international research and development in selected technologies. Additional support is provided by other agencies, such as DOE, DOC, DARPA, DOD, NASA, NIH, and NIST, based on their specific interests. Two JTEC/WTEC panels have recently reported preliminary findings at workshops held in the Washington, DC area:

The JTEC/WTEC panel on Advanced Casting Technologies reported on Feb. 27 that best-practice Japanese metal mold casting plants are world leaders in the application of advanced technology and in environmentally benign ("green") production. However, computer usage in the Japanese casting industry, particularly the use of 3D CAD, lags that in the United States. The panel will conclude its study mission with visits to selected Western European casting plants and laboratories in early April, followed by an additional panel presentation at the American Foundrymen's Society (AFS) Casting Congress in Philadelphia on April 23. JTEC/WTEC will publish a written final report later this year.

Following from the castings panel's observation that 3D CAD is not in widespread use in Japan, the JTEC/WTEC Rapid Prototyping (RP) panel reported on March 7 that this has resulted in a lag in the penetration of RP in both Japan and Germany. Despite this, basic RP technology development (e.g., machine design) in Japan and Europe is at parity with that in the United States. Europe is making significant strides in the development of general purpose software for RP, in the use of RP for tooling, and in layered powder process developments. The United States holds a clear lead over both Japan and Europe in process innovation, materials and applications. However, the panel concluded that major government-funded RP initiatives in both Japan and Germany could overwhelm the fledgling U.S. RP industry. This panel will present these results again at the Society of Manufacturing Engineers meeting in Dearborn, Michigan on April 22 of this year.

As of April 1, two new JTEC/WTEC final reports are available: optoelectronics in Japan and the United States, and human computer interface technology in Japan. Other ongoing studies include superconductivity (Japan and Western Europe), the Korean semiconductor industry, and electronics final assembly technologies in the Pacific Rim. The latter two studies represent the first efforts of a new JTEC/WTEC and NSF initiative inviting the U.S. research community to propose new topics for JTEC/WTEC studies entitled, "community-initiated state-of-the-art reviews" (CISAR). Further information on the CISAR initiative and all of the studies described above is available on the JTEC/WTEC WWW server: http://itri.loyola.edu. This server includes hypertext versions of all JTEC/WTEC final reports completed in the past two years.

For additional information, call Mr. Herer at (703) 306-1303.

## Project City

NSF's recent Annual Report highlighted developments by *Project City* (**C**ivil **I**nfrastructure **T**echnolog**Y**) in the support of sustainable management of civil infrastructure. This project focuses on developing a principled methodology for the study of work practices, problem solving, coordination, and the use of technology in an organization. The integration and further development of existing information technology helps support team decision making. This support is unique in that research and new information are being applied to Fort Gordon, Georgia.

Sustainable management requires an evolutionary view of civil infrastructure systems as large, complex, heterogeneous, distributed, and dynamic systems that affect, and are affected by, their environmental, social, political, and economic context. The life cycle of such systems includes the process of design, construction, operation, maintenance, repair, rehabilitation, and disposal. Throughout all these phases, coordination is required among distributed, heterogeneous groups of experts to support efficient, correct, cost-effective, and sustainable practices and outcomes. A fundamental aspect of information technology applications for the sustainable management of civil infrastructure is that successful solutions are not merely technical, as in the design and implementation of information technology, but also social. For example, the systems consider human problem solving, work practices, communication, management, and organizational structure. Furthermore, the social and technical aspects of these systems mutually influence one another. Thus, the fundamental requirement for successful design and implementation of information technology to support sustainable management is an overarching methodology that encompasses the study of existing work and organizational practices. The emphasis of Project City is on the integration of existing software tools and heterogeneous databases and the implementation of the management strategy at a controlled site. Many of the components of the sustainable management methodology have already been developed and implemented on a limited scale. The challenges addressed here are the interfacing of numerous existing heterogeneous data and management systems and the effects of scaling. It should be remembered that high performance computing and communications may not be necessary for conceptual development, but are indispensable for implementation.

The site selected for this controlled experiment is the U. S. Army's Fort Gordon, Georgia, home of the 15th Signal Brigade and the Dwight D. Eisenhower Army Medical Center. Fort Gordon's population (approximately 36,000) and aging infrastructure of roads, railways, electrical power lines, and natural gas, water, and sewage pipelines are similar to that of a small city. This controlled environment provides an opportunity to conduct experiments in applying information technology to the problems of the sustainable management of civil infrastructure. Fort Gordon is designated as a model installation for the 21st century by the U. S. Army's Training and Documentation Command. This makes it an ideal site because of its commitment to utilize advanced information technology.

This project is being supported under an NSF grant, *The Sustainable Management of Civil Infrastructure: A Methodology and Testbed to Bridge Information Technology and Applications.* Additional information concerning Project City may be obtained from: These Web sites:

http://www.spcomm.uiuc.edu/Projects/COLLAB/projcity.html

http://www.spcomm.uiuc.edu/Projects/COLLAB/teclab.html

For additional information call Dr. George Lea at (703) 306-1339.

# *Young Researchers to Visit Nanoparticle Research Facilities in Japan*

Ultrafine particles of semiconductor, metal, or ceramic materials with diameters in the nanometer size range exhibit unique electronic, optical, magnetic, and structural properties different from those exhibited by larger particles. So far, most materials made from nanoparticles have been produced only in small quantities in the laboratory. An initiative developed in the Division of Chemical and Thermal Systems (CTS) in collaboration with Electrical and Communications Systems (ECS) and other organizations has funded about 20 interdisciplinary groups since 1990 to develop new fundamental concepts for high-rate production of nanoparticles with engineered properties. The projects have led to important fundamental discoveries and a series of patents. The work is particularly relevant for advanced materials research because most nanostructured materials with engineered microstructure (ceramics, special metals, optical and electronic materials) are formed by putting together blocks of precursor nanoparticles. Because of the relative speed with which research results have achieved technological relevance, this initiative has attracted the attention of the media, including *Business Week* and *Chemical Engineering* magazines, as well as numerous industrial partners and other agencies such as NIST, AFOSR, and DOE. The new methods for generation of nanoparticles include a laser ablation approach, plasma expansion process, spark erosion, a microemulsion vesicular approach, a combustion approach, and various aerosol processing techniques. The evaluation of the first group of three-year projects was made in a joint NSF conference with industry and NIST.

As a result of this ENG initiative, there are more than 40 young engineers and scientists nearing completion of their Ph.D. education in the area of nanoparticles and nanostructured materials. Much of the outstanding research in this emerging area is also being done in Japan. In order to offer young U.S. researchers an opportunity to visit those laboratories, present their own work, and develop long-term collaborations with the Japanese colleagues, NSF has initiated a two-week workshop and visit program for about 15 young engineers and scientists to Japan. The workshop will be held in Tsukuba, October 28 through November 1, 1996, and will be followed by visits to industrial, government, and academic laboratories. Participation in this NSF-sponsored program is open to qualified applicants, following a selection process chaired by Prof. James R. Brock (Department of Chemical Engineering, University of Texas, Austin). Applicants must be U.S. citizens and Ph.D. students or postdoctoral researchers with strong interest in nanoparticle synthesis. Applicants should send an extended abstract of a research paper for presentation at the workshop, a curriculum vitae, a career statement describing how participation in the workshop is important to them, and two supporting letters from senior researchers. These materials should arrive before May 15, 1996, to Prof. Brock. The Japanese side of the workshop is under the direction of Prof. Kikuo Okuyama (Department of Chemical Engineering, Hiroshima University) and Prof. Hiroshi Komiyama (Department of Chemical Engineering, Tokyo University), with sponsorship from the Japan Society for Promotion of Sciences.

Dr. Mihail Roco can be contacted for additional information by calling (703) 306-1371.

## Calendar of Events

(Listed events involve ENG sponsorship or participation.)

### NSF 1996 Exhibit Schedule

| | |
|---|---|
| **June 23–26** | American Society for Engineering Education (ASEE), Washington, DC |
| **June 30–July 5** | ECS—International Federation of Automatic Control (IFAC) World Congress, San Francisco, CA |
| **Nov. 6–9** | BES—Environmental Technology Expo, Atlanta, GA |
| **Nov. 10–14** | CMS—American Society of Civil Engineers (ASCE), Washington, DC |
| **Nov. 11–14** | CTS—American Institute of Chemical Engineers (AIChE), Chicago, IL (hospitality suite) |
| **Nov. 19–21** | DMII—International Mechanical Engineering Congress & Exposition, Atlanta, GA |
| **Jan. 7–10, 1997** | DMII—NSF Design and Manufacturing Grantees Conference, Seattle, WA |

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